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ABSTRACT

This paper describes the results of research evaluating the use of mixed-mode surveys in institutional research. Surveys were administered to 1999-2000 graduates at Red River Community College in 2 phases. Phase 1 offered three modes of response: mail, Web-based, and touch-tone data entry (TDE). Phase 2 (administered to non-respondents of Phase 1) consisted of a telephone interview. The census was distributed to 1,483 graduates and consisted of 16 questions that explored graduates' employment or continuing education circumstances, and satisfaction with their college education. The response rate from Phase 1 was 35%, significantly lower than the previous 4 years, when mail was the only mode utilized. Mail was by far the most effective mode of the first phase, with a 25% response rate. TDE and Web-based modes had very low rates of response. Phase 2 yielded a response rate of 30%, bringing the overall response rate to 65%, which is comparable to response rates from earlier years. The research supports the value of mixed-mode surveys, at least in sequence, for improving response rates, perhaps because the use of different modes highlights the importance of the survey and encourages response. In contrast, the use of simultaneous mixed modes did not have a positive effect on rates. (Contains 47 references and 13 tables.) (CB)

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Mixed mode effects in a community college graduate survey

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Abstract

A perennial issue facing survey research is obtaining satisfactory response rates. One method for improving rates is to offer multiple modes for response. An associated issue is the effect of differing modes. This research examined both matters using a survey of community college graduates. Fielding consisted of two phases. Phase One offered three modes for response, while Phase Two consisted of telephone interview of non-respondents to Phase One. Response rates, measures of data quality, demographic variables and attitude variables are compared across modes. The implications for institutional research are discussed.

Mixed mode effects in a community college graduate survey

One of the primary issues facing survey research is how to obtain satisfactory response rates (Cochran, 1977; Kish, 1965: Groves, Dillman, Eltinge & Little, 2002; Mangione, 1998). Survey nonresponse occurs at the unit (failure to obtain any response from a survey unit) or item (failure to obtain responses to individual questions) level and results in missing data (Dillman, Eltinge, Groves & Little, 2002). This is a problem because it introduces less efficient estimates, leads to issues in using statistical procedures and may bring in biases due to systematic differences between survey respondents and nonrespondents (Huisman & van der Zouwen, 1998). This is becoming increasingly a concern, as unit response rates in some situations appear to be declining (Atrostic & Burt, 1999; Atrostic, Bates, Burt, Silberstein & Winters, 1999; Camburn, Gunther-Mohr, & Lessler, 1999; de Leeuw & de Heer, 2002; Steeh, 1981). Item nonresponse is also an issue and has been studied for a number of years (for example: Ferber, 1966; Mason, Lesser & Traugott, 2002) as it results in missing data values and an overall reduced data base. Employing methods to increase unit response rates must be tempered by concerns over the potential for higher item nonresponse.

It is important for institutional researchers to use survey methods that maintain acceptable response rates. The fundamental role of institutional research and planning in post-secondary education is to provide the analytic inputs to facilitate decision-making (Frost, 1993: McLaughin, Howard & McLaughin, 1998). These analytic inputs must be founded on sound research methods. The purpose is to improve institutional intelligence and augment institutional learning and advancement (McLaughlin & Howard, 2001). Institutional research and planning brings knowledge to bear on the future of the

institution (Peterson, 1999) and this is often through survey research strategies. In post-secondary educational institutions the design, collection, analysis and reporting of survey work must adhere to the highest standards of research. This will increase in importance, if Keller (1995) is right that senior academic management will be more closely tied to quality institutional research in the future.

A significant volume of work has been undertaken to identify ways to improve response rates (see Groves, Cialdini & Couper, 1992; Janota, Baum & Slater; 1999). Respondents vary in their preference for survey mode and may appreciate being able to choose their own response mode (Groves & Kahn, 1979; Swoboda, Muehlberger, Weitkunat & Schneeweiss, 1997). Mixed mode strategies have been found to be successful (Schaefer & Dillman, 1998). However sometimes giving respondents a choice of response mode does not improve response rate, even though one mode may be substituted for another (Dillman, Clark & West, 1995). However sequential changes in modes appear to improve response rates (Shettle & Mooney, 1999). These may be effective not only because people have mode preferences but also because having different modes highlights the importance of the survey and encourages response (Dillman, 2000).

Traditionally, surveys have been conducted by face-to-face interviews, telephone interviews or mail questionnaires. There are a number of newer methods of conducting surveys, many relying on computer assisted techniques. Modes such as e-mail and web-based techniques for surveying have evolved quickly and are becoming useful additions and alternatives to traditional modes (Dillman, 2000). Nathan (1998) argued that new technological developments in communication imply that mixed mode surveys will

become predominant. Newer modes include touch-tone data entry (TDE) where respondents reply by a telephone touch-tone pad to recorded instructions, (this is also sometimes referred to as interactive voice response (IVR) when the predominant response is through verbal recordings), and Internet (Web) based surveys, either through e-mail methods or through a URL link to an electronic questionnaire for prospective respondents. Borden, Massa and Milam (2001) contend that institutional research will expand its use of on-line surveys in the future. Such use must adhere to high survey standards, including an understanding of the appropriate protocols and effects of newer survey modes.

Generally, web-based response rates, in comparison with traditional modes, have been low (Abraham, Steiger & Sullivan, 1998; Couper, Blair & Triplett, 1997: Sheehan & McMillan, 1999). There seems to be little research on response rates with TDE.

Although employing a mixed mode approach to survey research may result in improved unit response rates; there is a concern with whether or not such a strategy biases results. There are many aspects to this. Employing a mixture of data collection modes in survey research to increase unit response rates may lead to higher item nonresponse rates. Generally the respondent mean is a function of two sources - unit and item nonresponse. If the frequency of item nonresponse increases with additional methods used to increase unit response, there may be a loss in estimates. Hence, overall data quality may be affected by a mixed mode strategy. However, there are many factors influencing item nonresponse including interviewers, question topics and structures, question difficulty, respondent attributes, along with survey mode (Dillman, et. al., 2002). The research on mode impact on item nonresponse has been mixed, (see Yun & Trumbo,

2000). In some situations open-ended questions have been answered more fully on-line compared with paper and pencil (Bachmann, Elfrink & Vazzana, 1996; Schaefer & Dillman, 1998). Tourangeau, Rips & Rasinski (2000) found that item nonresponse was more likely in self-administered survey questionnaires than those conducted by telephone. Stanton (1998) found that a web base survey had fewer missing values than paper and pencil.

If respondents do vary in their preference for survey mode (Groves & Kahn, 1979), they may vary on key demographic variables. As well, offering different modes may affect the representativeness of respondents to the population under study.

Different survey modes may also lead to mode difference in response, that is, respondents in one mode may have responded differently in another mode. Mode differences in response have been observed (Dillman, Sangster, Tarnai, & Rockwood, 1996; Schwartz, Strack, Hippler, & Bishop; 1991). This has been attributed to differences between self-administered and interviewer controlled questionnaires and the difference between aural and visual presentations of questions (Dillman, 2000). In an interview situation a respondent interacts with another person who controls the asking of questions. Such a circumstance may evoke a social norm approach to responses leading to social desirability and acquiescence in response. Schuman and Presser (1981) suggested that respondents are more likely to agree than disagree when interacting with people. Cognitive differences arise from visual versus aural communication. Tarnai and Dillman (1992) found such differences in responses to a sequence of satisfaction with community questions.

The potential for improving response rates by offering multiple modes of survey response is examined in this research along with the effects of differing modes. A large Western Canadian comprehensive community college has conducted a census survey of graduates for several years, using a mixed modes strategy. This involved an initial phase of two waves of mail surveys followed by a telephone survey of nonrespondents. The strategy recognized the finding that some individuals require prompting through multiple contacts to complete surveys (Brennan & Hoek, 1992; Dillman, 2000). College staff conducted the first phase while a professional survey research company undertook the second phase. Mail was less costly than telephone and the intent was to capture a larger portion of graduates through the mail portion. It was observed that over the last four years the response rate (calculated as number of completed/number in the census) for Phase One declined from 54.3% to 42%, while the rate for Phase Two increased from 13.5% to 22.5%. Interestingly the first wave response rate declined from 37.9% to 25.6% while the second wave rate was stable.

These findings, along with intent to explore the potential of employing newer survey strategies, led to a study of different modes of survey fielding with the graduate satisfaction and employment survey. This research had four main objectives. The first was to examine the impact of a mixed mode survey strategy on unit response rates. This involved an examination of the separate and cumulative unit response rates for different response modes offered to respondents. It was hypothesized that offering multiple modes of response would increase overall response rates in Phase One of the survey. It was also hypothesized that there would be variations in response rates across modes. As well, it was thought that offering a mixed mode sequence would increase unit response rates

considering both phases. The second objective was to examine the impact of a mixed mode survey on item nonresponse. The expectation was that there would be variations in item nonresponse by mode with telephone exhibiting less item nonresponse on closed ended questions. It was also expected that respondents through the web-based mode would provide a higher volume of open comments. Third, this research investigated the impact on the representativeness of respondents through a mixed mode survey mode. It was expected that respondents would vary on key demographic variables across modes but that the aggregate of respondents would closely align with nonrespondents. In addition it was hypothesized that offering a sequential mode would improve the representativeness. The expectation was that respondents in the sequential phase would be more like nonrespondents. The last objective was to examine respondent response similarities and differences by mode. Mail and web-based survey modes are visual and are controlled by the respondents. The telephone mode is aural and controlled by an interviewer. The TDE mode is a mixed presentation. Respondents listened to a taped recording asking (not a live person) of questions. Although the presentation was aural, they also had a paper copy of the questionnaire to follow, if they wished. For research purposes, It was hypothesized that (a) Phase One respondents would not exhibit differences in attitudes, due to an attempt to have the survey instrument nearly identical across modes, and (b) telephone respondents would be more likely to express agreement with attitude items, that is, telephone respondents would have higher mean scores than the other three modes. A concern with this aspect of the research is that if the response rates vary widely across modes, which is expected, any differences may be due to the fact

that people with different views may be more likely to respond by one mode than another.

Methods

Using a data set of all 1999-2000 graduates from certificate and diploma programs at the community college, fielding consisted of two phases for the census survey. Phase One was conducted by offering three modes for response, by mail, web-based and touch-tone-telephone data entry (TDE). The mail and web-based components were administered by college staff while the TDE mode was conducted by an external professional survey research company. Phase Two consisted of telephone interview by a different external professional survey research company of nonrespondents to Phase One.

At the community college the Graduate Satisfaction and Employment Survey is conducted annually to assess outcomes for graduates and their perceptions of the college experience. The survey is also a component of the accountability requirements for the college. Results are reported by individual program, division and college wide every year in a public document. The total number of 1999/2000 graduates was 1,606, for 123 no addresses or phone number could be obtained or the initial mailing was returned as moved, etc., leaving a deliverable frame of 1,483 graduates. Male graduates represented 52.9% of the census. The mean age at graduation was 25.7 (*SD* 6.7) and the median age was 23.3. Diploma students represented 59.7% and certificate students 40.3% of graduates. These variables were derived from institutional data and merged with the survey dataset. The number of institutional variables were limited due to issues surrounding informed consent and the protection of the privacy of personal data legislation.

Fielding protocol for the First Phase included a survey questionnaire and personalized letter sent to each student who graduated. This initial mailing presented graduates with three alternatives for responding: through a stamped, addressed return envelope, a URL for a web based survey, and a TDE mode. Prospective respondents were supplied with a unique identifying code to access the latter two modes. A second survey and letter were sent to those who did not respond by any mode to the initial request. Phase Two involved a telephone survey of the non-responding graduates to the First Phase. The telephone survey instrument modeled the mail questionnaire and the follow-up protocol involved up to five callbacks.

The survey instrument was relatively short, consisting of a total of sixteen questions (not all respondents would answer all questions) with an opportunity for open-ended comments. The questions explored aspects of graduates' employment or continuing education circumstances and satisfaction with their college education. The web-based survey instrument modeled the mail questionnaire and the TDE voice instructions paralleled the mail questionnaire, which all respondents would also have been able to follow. Closed questions were answered through keying while open questions were answered by voice and recorded.

The independent variables for this research were mode and phase. The dependent variables are described in relation to the research objectives.

The impact of modes will be evaluated using unit response rates. Rates were calculated for each of the modes and for each of the phases. These rates were compared with previous years and across modes and phases. Where relevant chi-square was used to assess significant differences.

Data quality was investigated through an analysis of the care taken in completing the survey instruments by reviewing the item completion rates across modes. This also was an attempt to investigate the degree of involvement of respondents in the survey. Considerations included: missing values across modes for fixed response questions, missing values on open response category questions, the number of respondents providing comments or suggestions for improvements, and the number of No Opinions (the attitude questions had four categories with an additional category to record No Opinion). Differences were assessed through chi-square. In additional comment volume was compared across modes by mean word counts and assessed through one-way analysis of variance.

Nonresponse error related to key demographic variables was also evaluated. The variables were gender, age, monthly earnings, achievement (certificate or diploma) and current activity. Respondents by mode in Phase One were compared, respondents across all modes and the overall Phase One was compared with Phase Two. Differences by gender, current activity (employed/self-employed, student, unemployed) and achievement were compared through chi-square. Age and monthly earnings means were compared through one-way analysis of variance across modes. In addition, comparisons with nonrespondents on gender, achievement and age were calculated to understand the representativeness of the response set over modes.

The response differences on variables assessing attitudes were compared across modes. Seven questions on the survey instrument asked respondents to indicate their degree of agreement with statements regarding: whether they would recommend their program to others, satisfaction with education received, satisfaction with the currency of

program, whether instructors were knowledgeable, quality of training materials, appropriateness of the technology, and reasonableness of the cost. A one-way analysis of variance was conducted for Phase One modes to determine mode effects. A one-way analysis of variance was also conducted for all modes to determine if an interviewer controlled situation resulted in more respondent agreement. To investigate this more fully, the seven items were considered to be a scale and a factor analysis was used to confirm this and subsequently the summated scale scores were used to assess attitude differences first for Phase One to determine if there were mode effects and then across all modes to determine if there were effects related to varying types of modes, such as self-administered (Mail and Web-based) combined mode (TDE, although it was primarily self-administered) and interviewer controlled (telephone).

Results

Response Rates

The response rates for all modes in the survey of 1999-2000 graduates are displayed in Table 1. After the first wave, the response rate was 20.7% and after two waves of mail-outs, 35.2%. These rates were unexpectedly lower than the previous four years. Table 2 displays the response rates for surveys of graduates from 1995-1996 through 1999-2000. The first phase census response rate was 42.0% for 1998-1999 graduates, 41.9% for 1997-1998 graduates, 41.6% for 1996-1997 graduates and 54.3% for 1995-1996 graduates. All of these earlier surveys were conducted with postal return only for the first phase.

Phase One respondents were more likely to have cooperated through mail (χ^2 (2, n = 565) = 398.69, $p < .0005$). Response rates for the three initial modes were: Mail,

25.6%, TDE, 4.5%, Web-based, 5.0%. These response rates varied greatly over modes and are similar in general to others reported (Dillman, 2000), although the rates found in this research may be even lower. By far mail was the most effective response mode of the first phase. The TDE and Web-based modes had very low response rates. Both of these modes required respondents to access a secondary means, that is, a touch-tone telephone or a computer with Internet access, to respond. This may have acted as a deterrent or barrier.

The response rate for the second phase (telephone) was 29.6%, yielding an overall response rate of 64.8%. This compares with an overall response rate of 64.6% for 1998-1999 graduates, 60.1% for 1997-1998 graduates, 71% for 1996-1997 graduates, 67.8% for 1995-1996 graduates, all conducted with sequential modes of mail only followed by telephone. Through all of these surveys the use of a second mode has resulted in substantially increased overall response rate, more than could be achieved through additional First Phase waves. Mangione (1998) indicated that subsequent waves of mail surveys achieve response rates about half of the previous wave.

Care taken in completing surveys

An important part of this research was to understand the degree of care taken in completing the survey instrument by mode type. As well, this measured the degree of involvement in the survey in relation to survey mode, particularly through No Opinions and comment volume. The missing values and rates are presented in Table 3. There were thirteen closed response category questions. The questions asked about current activity, reasons for being unemployed, when a job was accepted, whether work was full or part time, whether the job was related to training at the College, how a job was found, and

seven questions about graduates' attitudes towards their experience at the College. The overall missing values percent (for eligible respondents for each question) was 0.5%. The rates for the modes were, Mail, 0.7%, TDE, 3.1%, Web-based, 0.3% and Telephone, 0.0%. Respondents through the web were more likely to have missed completing the closed ended questions than mail respondents. In the context of a telephone survey, the interviewer controls the stimulus and, in this survey, achieved full completion of all the closed category questions. The seven attitude question included a No Opinion response category. There were no significant differences on the rate of selection of No Opinion among modes. There were three opened ended questions asking for salary, position title, and employer name. The overall missing value percent was 22.7%. The percents for the modes were, Mail, 19.3%, TDE, 32.6%, Web-based, 13.9% and Telephone, 25.4%. Respondents through the TDE mode were more likely not to complete these questions than respondents through any of the other modes, while telephone respondents were more likely to miss questions than web respondents (see Table 4).

The questionnaire provided respondents with the opportunity at the end to provide comments or suggestions for improving program educational quality at the College. Overall 52.2% provided comments. The rates for the modes were, Mail, 54.4%, TDE, 28.4%, Web-based, 54.3% and Telephone, 53.8%. Respondents through the TDE mode were more likely not to be involved with the survey than respondents through the other three modes (χ^2 (3, n = 1041) = 20.622, $p < .0005$).

Considering those 543 respondents who provided comments, the mean number of words included for all modes was 26.7. The means for the modes were Mail, 37.0, TDE, 48.9, Web-based, 81.2 and Telephone, 6.7 (see Table 5). A one-way analysis of variance

revealed significant differences between modes as was expected. A post hoc comparison using Bonferroni revealed that web-based mode respondents provided significantly more content than the other modes and that telephone respondents provided significantly less content than the other modes. Telephone comment volume was lower likely as an artifact of the interview situation where the interviewer would input abbreviated comments as a respondent spoke and then read back the comments and not provide a verbatim recording. It has been suggested that web-based surveys have higher volumes due to the speed of key stroking over handwriting (Bachman, et. al., 1996).

Survey mode and nonresponse errors related to demographic variables

There were two methods for comparing nonresponse error related to the demographic variables. The first evaluation compared reported demographics across modes and across phases. The variables were gender, age, monthly earnings, achievement, and current activity. The latter three variables were also outcome variables. Table 6 presents the number and percent for gender, current activity and achievement, and means and standard deviations for age and monthly earnings by mode and phase.

There were no significant differences in respondents by current activity or age across modes, within Phase One, or from Phase One to Phase Two using chi-square. Most respondents were employed/self-employed. A one-way analysis of variance was calculated with monthly earnings as the dependent variable and survey mode as the independent variable. There was a significant effect of mode, $F(3, 714) = 5.291$, $p = .001$. A post hoc comparison using Bonferroni showed that respondents through the web reported significantly higher monthly earnings than other mode respondents. The overall mean for all respondents was \$2,043 (*Mdn*=\$1,920), and for mode respondents at \$1,969

(*Mdn*=$1,872) for Mail, $2,032 (*Mdn*=$1,976) for TDE, $2,425 (*Mdn*=$2425) for Web-based and $2,046 (*Mdn*=$1920) for Telephone. Considering gender, female respondents were more likely to be early responders, that is in Phase One (58% out of total female respondents) than males (51% out of total male respondents) and this was significant, χ^2 (1, n = 1037) = 5.405, p = .02. Overall there were more male graduates than female. Graduates from the College receive either a certificate for a one year program of studies or a diploma for a two year program of studies. Respondents who achieved a certificate were more likely to have responded in Phase Two (telephone mode) χ^2 (1, n = 1041) = 13.191, $p < .0005$).

The second evaluation compared age, gender and achievement of respondents by mode and phase with nonrespondents. This second analysis aimed at understanding the representativeness of respondents. As Table 7 illustrates, survey respondents were not different from nonrespondents with regard to gender. This was also true for all gender comparison of individual mode respondents to nonrespondents: mail and nonrespondents (χ^2(1, n = 976) = 1.638, *ns*), TDE and nonrespondents (χ^2(1, n = 637) = .527, *ns*), Web and nonrespondents (χ^2(1, n = 644) = .892, *ns*), telephone and nonrespondents (χ^2(1, n = 1040) = 2.095, *ns*). Table 7 also shows that survey respondents were not different from nonrespondents by age. This was also true for all age comparison of individual mode respondents to nonrespondents: mail and nonrespondents (t(968) = .692, *ns*), TDE and nonrespondents (t(630) = -.064, *ns*), Web and nonrespondents (t(638) = -1.361, *ns*), telephone and nonrespondents (t(1031) = -.590, *ns*). These findings suggested that each of the mode's respondent set was similar to nonrespondents, providing overall comfort in the utility of the survey findings. Respondents were different from nonrespondents by

achievement, as graduates with certificates were more likely to be nonrespondents than graduates with diplomas. Table 8 presents chi-square results for tests on survey mode and phase with regard to respondents' achievement. The distribution of respondents by achievement in Phase Two was not different from the distribution for nonrespondents. This suggests that late respondents in a mixed mode strategy tend to be akin to nonrespondents, at least on one variable, as has been found in mail surveys (Moore & Tarnai, 2002). This suggests that the sequential modes have the potential to contribute to the reduction of nonresponse error by increasing the similarity between respondents and nonrespondents. It is interesting to note that graduates with certificates earned $1,782 monthly, which was significantly less than the $2,187 earned monthly by graduates with diplomas, $t(716) = 6.88, p < .0005$). It has been found that nonrespondents tend to have lower socio-economic status than respondents (Goyder, 1987)). Another explanation is that certificate achievers, who are the College for one year, may not have developed as much of an association or involvement with the College as two year graduates.

Mode effects

Different types of collecting data from people may produce different results. One way of mitigating these concerns is through unimode questionnaire construction (Dillman, 2000). This was attempted in this research, as the survey instruments utilized for each of the modes were nearly identical.

There were seven questions on each instrument, asked in the same way, attempting to understand the attitudes of graduates towards their experience at the College. Table 9 provides frequencies and means for all modes and phases. A one-way analysis of variance was calculated with each attitude question as a dependent variable

and Phase One survey mode as the independent variable. As Table 10 illustrates, there was a significant effect of Phase One mode on only one question (knowledgeable instructors), $F(2, 547) = 3.302$, $p = .038$. Bonferroni's post hoc analyses revealed that mail respondents were significantly more likely to agree than respondents by web. Across all modes, the telephone survey produced the highest mean scores on all but one of the seven attitudinal questions. A one-way analysis of variance was also calculated with each attitude question as a dependent variable and all survey modes as the independent variable. The results of the analyses of variance and the Bonferroni post hoc tests are presented in Table 11. There was a significant effect with regard to three of the attitude questions. The post hoc analyses revealed that telephone respondents were significantly more likely to agree on knowledgeable instructors than web respondents, were significantly more likely to agree on appropriate technology than TDE respondents, and were significantly more likely to agree on reasonable costs than mail respondents. Given the number of possibilities on the Phase one comparisons, one effect does not seem to reflect a substantive difference effect through modes. There was some support for the notion that interviewer surveys tend to elicit more agreement from respondents.

To clarify this investigation, a factor analysis was used and through principal component analysis extracted one component (only component with an eigenvalue greater than 1, see Table 12). The Cronbach alpha of the scale was .8163, (Scale statistics: $M = 22.59$, $SD = 3.43$, n cases = 895) indicating high reliability. The underlying dimension that was being measured was overall satisfaction with an academic program and it was expected that there would be just one component. A one-way analysis of variance with the summated scale score as the dependent variable and Phase One modes

as the independent variable produced a significant effect , $F(2, 478) = 3.21$, $p = .041$. However, the post hoc analyses with Bonferroni revealed no significantly higher scores from any mode comparisons, although Mail contrasted with TDE was at $p = .054$. This suggested that any differences in response across modes in Phase One were at a minimal level. A one-way analysis was also calculated with all modes and the summated scale scores, $F(3, 891) = 3.03$, $p = .029$. Bonferroni's post hoc analyses revealed that respondents by telephone were more likely to agree than TDE respondents. This analysis suggested that Phase One mode effects were minimal and there was very limited support for the notion that interviewer surveys tend to elicit more agreement from respondents, although this only applies to the TDE mode. It is interesting that the TDE mode is a mixed presentation.

Discussion

The reason for this research was to understand more fully the impacts of a mixed mode survey strategy in institutional research, particularly in relation to newer modes. In a time of declining rates and the requirement for reliable data for decision-making a mixed mode strategy may be appropriate. Improved unit response rates can reduce nonresponse error allowing for confidence in the findings of surveys, as long as item nonresponse is not critically compromised, representativeness is achieved and any mode effects are limited.

There are several observations to make as a result of this study. First, there are a number of reasons for the trend of mixing modes (Dillman, 1999). The fact of declining response rates is just one. There has been an increase in the number of modes that are available for surveying such as fax, electronic mail, the Web, and voice activated or

touch-tone data entry. As well, people are more mobile today and live in changing arrangements and are likely best contacted by varying methods. It is challenging, if not impossible to reach all members of a survey population through one mode. The sophistication of current information and communication technology also allows for the management of complex surveys and makes using varying modes more efficient. There are numerous vendors and professional survey firms providing products and services using newer modes.

Second, this research supports the value of mixed mode surveys, at least in sequence, for improving response rates. Simultaneous mixed modes did not increase response rates, as offering an opportunity to respond by different modes did not have a positive effect on rates. Both the TDE and Web-based modes had very low response rates. It may be that the letter accompanying the mail outs was overly complex in its descriptions of the procedures for accessing the modes. The TDE mode was described in detail on an additional sheet that may have led to confusion or may have been missed or misplaced. There was not a coverage issue as 98.7% of Canadian households in 1996 had a telephone (Dickinson & Sciadas, 1997). As well, the intent of a survey is to induce individuals to decide to respond. Perhaps the introduction of another decision point, that is, what mode to use, led to potential respondents delaying the key decision. During 2000, about 53% of Canadians indicated that they used the Internet at home, work or somewhere else. Internet users differ from nonusers, with nonusers more likely to be older, have less education and lower incomes (Dryburgh, 2001). This illustrates the potential coverage error for Web-based surveys. In this study web-based respondents had

a significantly higher reported monthly earnings than other mode respondents. Moreover, the continuing value of mail as a survey mode was demonstrated in this research.

Third, TDE mode respondents exhibited significantly less care in completing the survey instrument, indicating that the mode appeared to lead to increased item nonresponse error. The novelty of this mode may have confused or discouraged respondents, as well as the fact that two methods were required for inputting responses by telephone key pad and by voice. Together with a very low unit response rate, these results suggest that TDE may not be an effective mode.

Fourth, the mixed mode strategy produced a set of respondents similar to nonrespondents on two of the three comparison variables. There was a difference on achievement, with certificate holders more likely to be nonrespondents. However, there is some support for the notion that having a sequential mode may augment the representativeness of respondents. Phase Two respondents were not different from nonrespondents by achievement, while Phase One respondents did differ from nonrespondents and Phase Two respondents. This suggests that having a sequential mode may augment the representativeness of respondents.

Fifth, the analysis of mode effects in Phase One indicates very minor mode differences on attitude questions, which suggest that mixed modes do not result in people responding differently depending on the mode. It also suggests that the attempt to have the survey instrument very similar across modes may have been successful in minimizing mode effects. There was very minor support for the idea that individuals tend to agree when interacting with other people.

There are limitations to this study and analysis of the impact of multiple modes for College surveys. It is a first level analysis with a focus on understanding the broad effects of a mixed mode strategy. The survey instrument was preexisting and was not designed specifically for a mixed mode assessment, although it was adapted for use in multiple mode forms. As well, the questions were determined by the graduates survey objectives and not this research. Response rates for web-based and TDE modes were very small, compromising the analysis. There were only limited demographic variables to compare respondents with nonrespondents. In addition, some of the variables were outcome variables that may determine a response set. Assessing mode effects is problematic. Just one of the other influencing variables is program taken; the program at the college can be quite different in content, technology used and style of instruction. Overall the scores on the attitude scale were high across all modes at an aggregate level while there are variations by program. This research was conducted at only one location and any generalizations are limited accordingly.

There will be practical consequences of this study. Achieving high response rates allows for confidence in low nonresponse error and in using the results of surveys for decision-making. The graduate survey at this community college is one of the main sources of outcome measures and for assessments of program relevancy. It is used in the strategic planning process and plays a role in policy making. For 2000-2001 graduates a sequential mixed mode strategy will be pursued, using mail only followed by telephone. TDE will not be pursued in the near future due to high unit nonresponse and high item nonresponse.

Nonresponse in web-based surveys is a complex issue with many levels including the coverage, technology itself, rapid technological changes, the often mixed mode approach at solicitation, which occurred in this research, and the increasing spread of Internet access (Vehovar, Batageli, Manfreda & Zaletel, 2002). Although web surveys do have low unit response rates now, they seem to offer great potential. In this research the web mode did have a low response rate, however it appears that web respondents took care in completing the survey and provided the highest content on the key open-ended question. One of the issues with web surveys is a growing impatience with slow interactivity on some surveys (Crawford, Couper & Lewis, 2001). The survey form used in this research was not designed for high interactivity. The problems with noncoverage and nonresponse are not unique to web surveys. Moreover, the web has a great potential for audiovisual and interactive self-administered surveys (Couper, 2000). The deployment of this potential through appropriate principles and techniques will improve rates (Dillman, Tortora & Bowker, 1998). Although a Web-based mode will not be pursued at this time for this particular survey, in the future a further test will be undertaken. As survey success depends on the cooperation of potential respondents it is logical that respondents' propensity for various modes be considered by institutional researchers in designing surveys.

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Table 1:

Response rates by mode and phase

Original census size		Phase 1*			Phase 2		Total	
		n	%		n	%	n	%
	Web-based	81	5.04					
	TDE	72	4.48					
	Mail	412	25.63					
1606	Total	565	35.24	Telephone	476	29.64	1041	64.82

Note. Response rate = completed questionnaires from eligible census members / the original number in the census
*$\chi^2 = 398.658$, $df = 2$, $p < .0005$

Table 2

Response rates by wave, phase and year

Graduate Year	Census size	Overall n	Overall %	1st wave n	1st wave %	2nd wave n	2nd wave %	Phase 2 Telephone n	Phase 2 %
1995-96	1510	1024	67.81	572	37.88	248	16.42	204	13.51
1996-97[a]	1470	1043	70.95	486	33.09	126	8.57	431	29.32
1997-98	1481	903	60.07	379	25.59	241	16.27	283	19.11
1998-99	1389	897	64.56	356	25.63	226	16.41	313	22.53
1999-00	1606	1041	64.82	332	20.67	233	14.51	476	29.64

Note. Response rate = completed questionnaires from eligible census members / the original number in the census
[a]The 2nd Wave of mailings was disrupted by an incorrect postal code on the return mail envelope.

Table 3

Impact of modes on care taken in completing the survey by mode

	Web-based	TDE	Mail	Telephone	Overall
Opportunities for responses on closed	897	829	4654	5360	11740
Missing values on closed questions*	3	26	31	0	60
Percent of missing values on closed questions	0.33	3.14	0.67	0.00	0.51
Opportunities for responses on open questions	180	187	1005	1148	2520
Missing values on open questions**	25	61	194	291	571
Percent of missing values on open questions	13.89	32.62	19.30	25.35	22.61
Opportunities for comments	81	72	412	476	1041
Comments***	44	19	224	256	543
Percent of respondents providing comments	54.3	28.4	54.4	53.8	52.2
Opportunities for response on 7 attitude Qs	567	504	2884	3269	7224
Number of No Opinions^	75	11	16	84	186
Percent of No Opinions	2.60	2.18	2.82	2.57	2.57

* $\chi^2 = 40.195$, $df = 1$, $p \leq .001$ contrasting Mail and TDE

** $\chi^2 = 18.65$, $df = 3$, $p \leq .001$

*** $\chi^2 = 20.622$, $df = 3$, $p < .0005$

^ ns on all χ^2 comparisons

Table 4

Open questions missing values significance comparisons by modes

	Web-based Vs Telephone		Web-based Vs TDE		Web-based Vs Mail		Telephone Vs TDE		Telephone Vs Mail		TDE Vs Mail	
df = 1	χ^2	*p*	χ^2	*p*	χ^2	*p*	χ^2	*p*	χ^2	*p*	χ^2	*p*
	6.39	≤.025	11.22	≤.001	2.11	ns	9.42	≤.01	0.05	ns	10.03	≤.01

Table 5

Word count by mode on the open question for program improvement comments

Mode	Web-based	TDE	Mail	Telephone	Overall
Mean	81.62	48.9	37.01	6.74	26.65
Std Dev	33.67	29.34	96.54	4.46	41.63

$F(3, 539) = 70.673, p < .0005$

Table 6

Comparison of demographics for respondents by mode and phase

Variable	Web-based		TDE		Mail		Phase 1 Total		Phase 2 Telephone		Survey total	
	n	%	n	%	n	%	n	%	n	%	n	%
**Gender*, ** **												
Female	34	42.5	7	51.4	211	51.5	282	50.18	204	42.9	486	46.9
Male	46	57.5	35	48.6	199	48.5	280	49.82	271	57.1	551	53.1
Current Activity* **												
Employed/self-employed	60	74.1	63	87.5	337	82.0	461	82.0	384	80.7	844	81.2
Student	12	14.8	4	5.6	45	10.9	61	10.9	62	13.0	123	11.8
Unemployed/not in workforce	9	11.1	5	6.9	29	7.1	40	7.1	30	6.3	73	7.00
Achievement^ - ^^ - ^^^												
Certificate	14	17.3	21	29.2	150	36.4	185	32.7	208	43.7	393	37.8
Diploma	67	82.7	51	70.8	262	63.6	380	67.3	268	56.3	648	62.2
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age↑	25.03	5.98	25.67	7.71	25.97	7.40	25.8	7.25	25.49	6.7	25.65	7.00
Monthly Earnings[a]	2425 [aa]	835	2032	876	1969	755	2040	797	2046	756	2043	778

* *ns* (χ^2 = 7.613, *df* = 3, *p* =.055 across all modes)
** χ^2 = 5.405, *df* =1, *p* =.02 Phase 1 to Phase 2
*** *ns* on all comparisons
↑ *ns*: *F*(3, 1031) = 5.85, *p* = .625

^ χ^2 = 24.175, *df* = 3, *p* < .0005 across all modes
^^ χ^2 = 11.721, *df* = 2, *p* =.003 across Phase 1 modes
^^^ χ^2 = 13.191, *df* = 1, *p* < .0005 Phase 1 to Phase 2
[a] *F*(3, 714) = 5.291, *p* = .001
[aa] Bonferroni: Web-based and Mail *p* < .0005, and TDE *p* = .049, and Telephone *p* = .005

Table 7

Nonrespondent, respondent and Graduates demographics

Variable	Nonrespondent		Respondent		Graduates	
	n	%	n	%	n	%
Gender*						
Female	268	47.4	486	46.9	754	47.1
Male	297	52.6	551	53.1	848	52.9
Achievement**						
Certificate	255	45.1	393	37.8	648	40.3
Diploma	310	54.9	648	62.2	958	59.7
	Mean	Std dev	Mean	Std dev	Mean	Std dev
Age[↑]	25.7	6.09	25.65	7.00	25.76	6.69

* χ^2 (1, N = 1602) = .047, *ns* (respondents to nonrespondents)
** χ^2 (1,1606) = 8.289, p = .004 (respondents and nonrespondents)
[↑] t(1593) = -.191, *ns* (respondents to nonrespondents)

Table 8

Significance tests on Achievement by Phase and Modes Respondents to Nonrespondents

Phase 1 and Nonrespondents (1, n = 1130)		Phase 2 and Nonrespondents (1, n = 1041)		Web-based and Nonrespondents (1, n = 645)		TDE and Nonrespondents (1, n = 637)		Mail and nonrespondents (1, n = 978)	
χ^2	p	χ^2	p	χ^2	p	χ^2	p	χ^2	p
18.238	≤.0005	.216	*ns*	24.071	≤.0005	6.630	=.01	7.219	=.007

Table 9

Frequency distributions for all modes of attitude questions (No Opinions excluded)

Variable	Web-based		TDE		Mail		Phase 1		Phase 2 Telephone		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Q10Recommend Program												
1 strongly	6	7.5	4	5.9	20	5.0	30	5.5	12	2.6	42	4.2
disagree	5	6.3	5	7.4	24	6.0	34	6.2	26	5.6	60	5.9
2 disagree	35	43.8	34	50.0	166	41.8	235	43.1	200	43.0	435	43.1
3 agree	34	13.8	25	36.8	187	47.1	246	45.1	227	48.8	473	46.8
4 strongly agree												
Mean	3.2125		3.1765		3.3098		3.2789		3.3806		3.3257	
Q11 Quality of Program												
1 strongly	6	7.5	3	4.4	15	3.7	24	4.4	11	2.3	35	3.4
disagree	3	3.8	2	2.9	32	8.0	37	6.7	37	7.8	74	7.7
2 disagree	44	55.0	47	69.1	223	55.6	314	57.2	264	55.8	578	56.6
3 agree	27	33.8	16	23.5	131	32.7	174	31.7	161	35.8	335	32.8
4 strongly agree												
Mean	3.1500		3.1176		3.1721		3.1621		3.2156		3.1869	

Q12 Program up-to-date												
1 strongly disagree	5	6.3	2	2.9	16	4.0	23	4.2	10	2.2	33	3.3
2 disagree	9	11.4	9	13.0	36	9.0	54	9.9	59	12.7	113	11.2
3 agree	45	57.0	38	55.1	220	55.0	303	55.3	237	51.0	540	53.3
4 strongly agree	20	25.3	20	29.0	128	32.0	168	30.7	159	34.2	327	32.3
Mean	3.0127		3.1014		3.1500		3.1241		3.1720		3.1461	
Q13Knowledge-able instructors												
1 strongly disagree	5	6.4	2	2.9	16	4.0	23	4.2	7	1.5	30	3.0
2 disagree	11	14.1	8	11.8	34	8.4	53	9.6	59	12.7	112	11.1
3 agree	44	56.4	37	54.4	207	51.2	288	52.4	225	43.9	513	50.6
4 strongly agree	18	9.7	21	30.9	147	36.4	186	33.8	172	37.1	358	35.3
Mean	2.9615		3.1324		3.2005		3.1582		3.2138		3.1836	
Q14 Current materials												
1 strongly disagree	2	2.6	2	2.9	14	3.5	18	3.3	11	2.4	29	2.8
2 disagree	6	7.8	4	5.8	30	7.4	40	7.3	53	11.3	93	9.1
3 agree	55	71.4	43	62.3	241	59.5	339	61.5	259	55.3	598	58.7
4 strongly agree	14	18.2	20	29.0	120	29.6	154	27.9	145	31.0	299	29.3
Mean	3.0519		3.1739		3.1531		3.1416		3.1496		3.1452	

Q15 Appropriate Technology												
1 strongly disagree	5	6.5	5	7.6	16	4.1	26	4.9	9	2.0	35	3.3
2 disagree	8	10.4	11	16.7	34	8.8	53	10.0	39	8.5	92	9.3
3 agree	44	57.1	32	48.5	213	55.2	289	54.6	248	54.1	537	54.4
4 strongly agree	20	26.0	18	27.3	123	31.9	162	30.4	162	35.4	323	32.7
Mean	3.0260		2.9545		3.1477		3.1059		3.2293		3.1631	
Q16 Reasonable cost												
1 strongly disagree	6	7.7	5	7.8	28	7.1	39	7.2	15	3.3	54	5.4 13.2
2 disagree	9	11.5	8	12.5	64	16.1	81	15.0	50	11.0	131	47.7
3 agree	41	52.6	33	51.6	185	46.6	259	48.1	216	47.4	475	33.7
4 strongly agree	22	28.2	18	28.1	120	30.2	160	29.7	175	38.4	335	
Mean	3.0128		3.000		3.000		3.0019		3.2083		3.0965	

Table 10

One-way ANOVA and post hoc (Bonferroni) across Phase 1 modes

Question	ANOVA	Post Hoc (Bonferroni)	Mode differences
Q10 Recommend Program	$F(2, 542) = 1.10, p = .334$		
Q11 Quality of Program	$F(2, 546) = .174, p = .841$		
Q12 Program up-to-date	$F(2, 545) = 1.15, p = .317$		
Q13 Knowledgeable instructors	$F(2, 547) = 3.30, p = .038$	.033	Mail / Web-based
Q14 Current materials	$F(2, 548) = .80, p = .802$		
Q15 Appropriate Technology	$F(2, 526) = 2.28, p = .104$		
Q16 Reasonable cost	$F(2, 536) = .007, p = .449$		

Table 11

One-way ANOVA and post hoc (Bonferroni) across all modes

Question	Significance	Post Hoc Significance (Bonferroni)	Mode differences
Q10 Recommend Program	$F(3, 1006) = 2.30, p = .076$		
Q11 Quality of Program	$F(3, 1018) = .61, p = .612$		
Q12 Program up-to-date	$F(3, 1009) = 1.14, p = .331$		
Q13 Knowledgeable instructors	$F(3, 1009) = 2.78, p = .040$	.032	Phone / Web-based
Q14 Current materials	$F(3, 1051) = .53, p = .662$		
Q15 Appropriate Technology	$F(3, 983) = 4.02, p = .007$	.026	Phone / TDE
Q16 Reasonable cost	$F(3, 991) = 5.26, p = .001$	.001	Phone / Mail

Table 12

Factor analysis on seven attitude questions, total variance explained

	Initial Eigenvalues		
Component	Total	% of Variance	Cumulative %
Component	Total	% of Variance	Cumulative %
1	3.365	48.066	48.066
1	3.365	48.066	48.066
2	.921	13.157	61.223
2	.921	13.157	61.223
3	.754	10.768	71.991
3	.754	10.768	71.991
4	.598	8.542	80.533
4	.598	8.542	80.533
5	.566	8.084	88.616
5	.566	8.084	88.616
6	.454	6.485	95.101
6	.454	6.485	95.101
7	.343	4.899	100.000
7	.343	4.899	100.000

Note: Extraction Method, Principal Component Analysis.

Table 13

Factor analysis, structure coefficients, Academic Program Satisfaction Scale

Satisfaction with quality	.779
Program is up-to-date	.734
Recommend program	.707
Technology is appropriate	.692
Materials are current	.672
Cost is reasonable	.648
Instructors are knowledgeable	.608

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